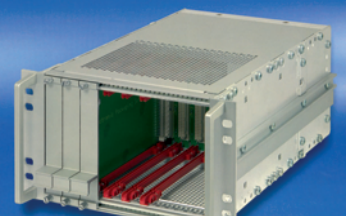
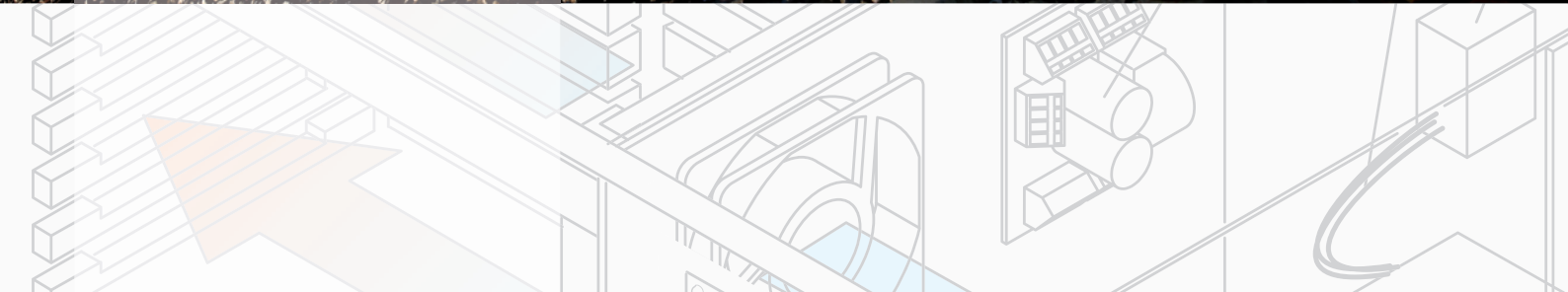
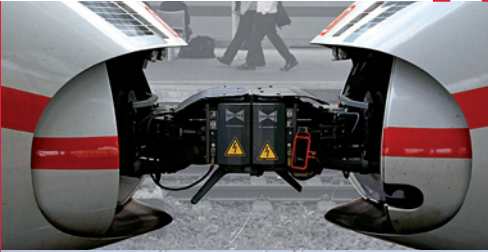


Railway Technology

Electronic packaging solutions for rail traffic systems



All components from a single source

Your partner for rail traffic



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For over four decades Schroff has been a world leader among developers and manufacturers of electronics packaging components and systems. Whatever challenges you have to overcome, together we can find the right solution. Our products and complete solutions combine the know-how of our specialists in the integration of mechanics, electronics and climate control together with many years of experience with the most diverse application requirements. They are based on globally standardised product platforms that support rapid, future-proof and cost-effective development. Schroff can offer design, project management, prototype and model construction, testing, certification, pre-production and series production under one roof, we can provide fully-equipped and verified systems from a single source – a service that you would demand from a leading supplier. Fast and tailored to your specific requirements and we will remain a reliable partner throughout the entire lifecycle of your products, worldwide.

Preface

All services under one roof

systems

Leading-edge technology and modern service



Competence for railways.

For more than 40 years we have claimed a worldwide leading position for the reliable and secure protection of electronic systems. Our decades of experience and comprehensive applications knowledge in rail systems enable us to offer precisely what will take you a step further: Complete solutions that can be implemented globally and are developed to meet your particular requirements, and that will withstand the strict safety requirements of railway applications, including international certification.

Wide selection and high flexibility.

Our comprehensive range of certified standard products demonstrates its capabilities and safe operation every day, on rail vehicles, in buildings and trackside. Thanks to our modular platform concept, Schroff products can be quickly and easily adapted to meet your individual requirements. They are in fact so flexible that they impress on two counts: by both their high level of technical functionality and their ergonomic appearance.

Project support and service.

Engineering and manufacturing know-how under a single roof guarantees our customers complete confidence, efficient implementation and fast delivery. With our global manufacturing facilities and sales organisations, we are near to where you are. As a result, our global project engineers have invaluable experience of our customers particular requirements in relation to specific locations. Our teams of experts are at your side worldwide, around the clock if necessary. Schroff supports you - for the entire life of the product.



Cutting-edge technology - customised

Components and system so

For stationary applications ...



The appropriate solution. For every situation.

Whether it be on rail vehicles, at the station, in the signal box or trackside, our modular product platform, specific applications expertise and innovative new technology allow us to offer individual solutions for every operating environment. Superb mechanics, shock and vibration resistance, perfect shielding, optimised cooling, dependable power supplies and outstanding system management ensure the secure protection of your electronics, including rail certification.

Wall mounted enclosures

- Dustproof and waterproof enclosures for use on the platform, in tunnels, on rail vehicles, in the station or in the maintenance shop
- Composite cases for highly corrosive environments

Indoor cabinets

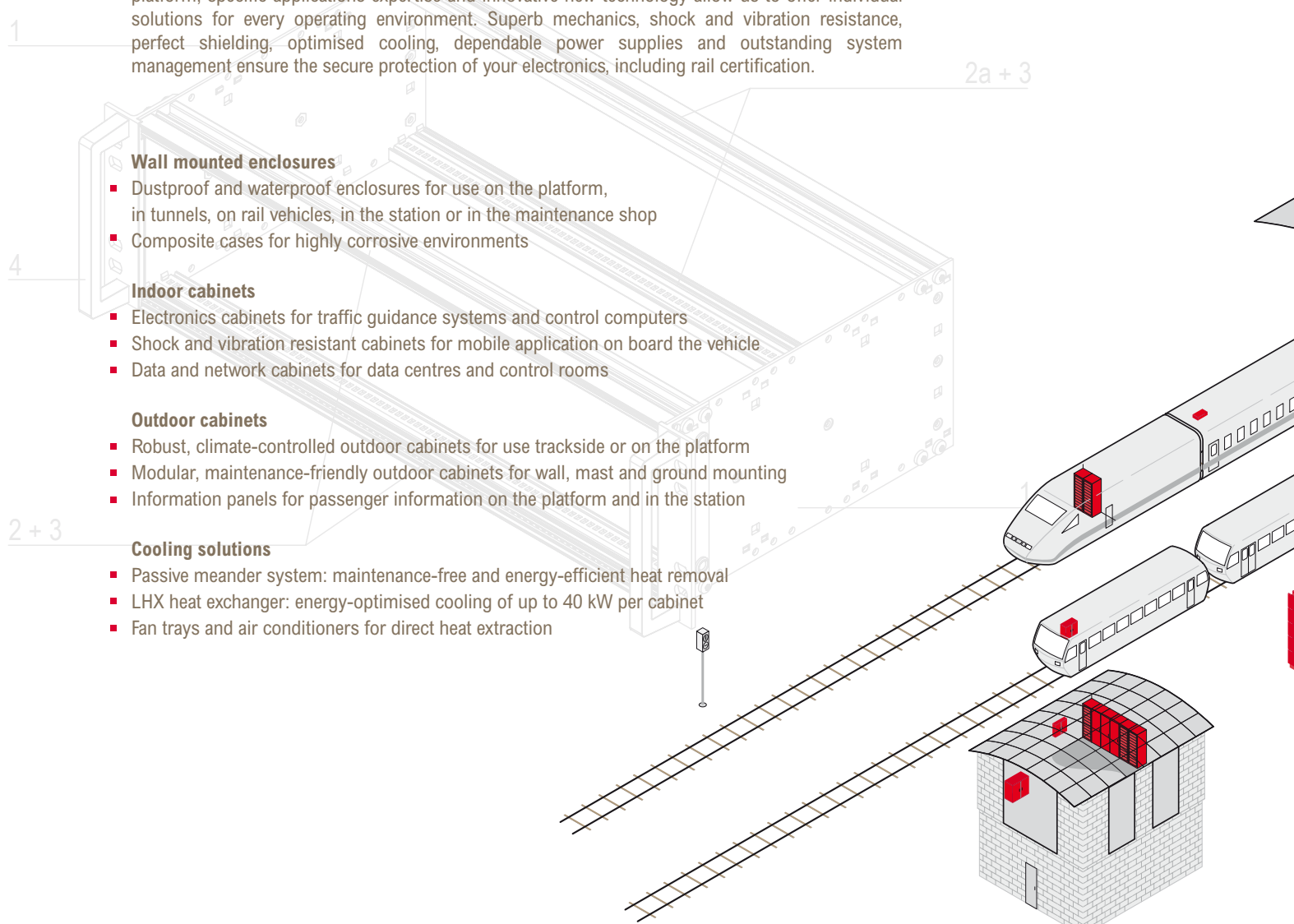
- Electronics cabinets for traffic guidance systems and control computers
- Shock and vibration resistant cabinets for mobile application on board the vehicle
- Data and network cabinets for data centres and control rooms

Outdoor cabinets

- Robust, climate-controlled outdoor cabinets for use trackside or on the platform
- Modular, maintenance-friendly outdoor cabinets for wall, mast and ground mounting
- Information panels for passenger information on the platform and in the station

Cooling solutions

- Passive meander system: maintenance-free and energy-efficient heat removal
- LHX heat exchanger: energy-optimised cooling of up to 40 kW per cabinet
- Fan trays and air conditioners for direct heat extraction

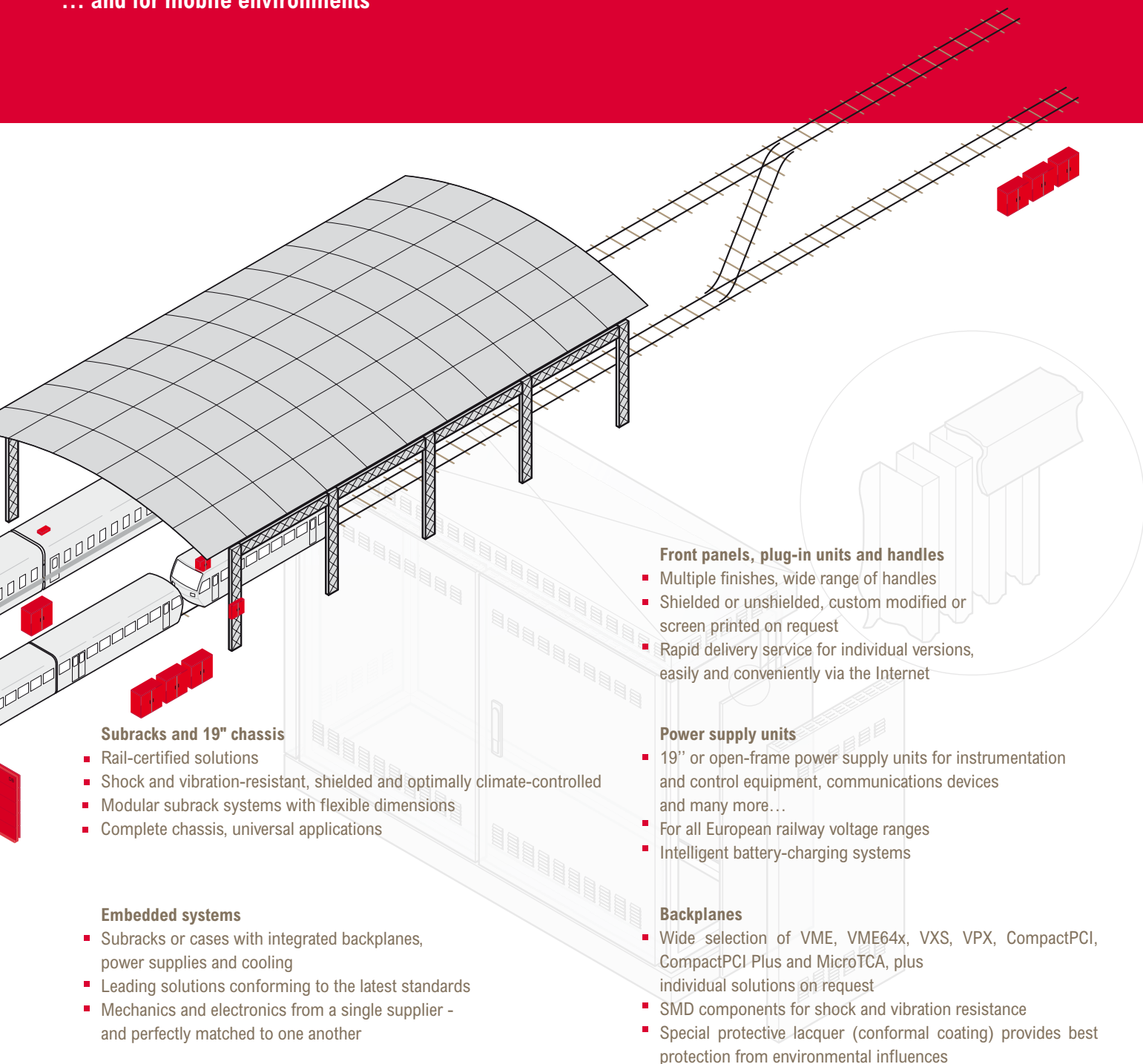


Electronic Packaging from Schroff – your route to quality!

Adapted to any application

Solutions

... and for mobile environments



Subracks and 19" chassis

- Rail-certified solutions
- Shock and vibration-resistant, shielded and optimally climate-controlled
- Modular subrack systems with flexible dimensions
- Complete chassis, universal applications

Embedded systems

- Subracks or cases with integrated backplanes, power supplies and cooling
- Leading solutions conforming to the latest standards
- Mechanics and electronics from a single supplier - and perfectly matched to one another

Front panels, plug-in units and handles

- Multiple finishes, wide range of handles
- Shielded or unshielded, custom modified or screen printed on request
- Rapid delivery service for individual versions, easily and conveniently via the Internet

Power supply units

- 19" or open-frame power supply units for instrumentation and control equipment, communications devices and many more...
- For all European railway voltage ranges
- Intelligent battery-charging systems

Backplanes

- Wide selection of VME, VME64x, VXS, VPX, CompactPCI, CompactPCI Plus and MicroTCA, plus individual solutions on request
- SMD components for shock and vibration resistance
- Special protective lacquer (conformal coating) provides best protection from environmental influences

Solid, robust and space-saving

Equipped for mobile enviro

Mechanics, electronics ...



Equipped for mobile environments.

For operation in mobile environments, electronic systems require a physical construction capable of withstanding extreme conditions in harsh environments. Our cabinets, cases and subracks are therefore designed to protect the electronics they house with high levels of mechanical stability and resistance to shock and vibration. Their dimensions are so flexible that you can make the best use of the available space, should this not be enough, we can simply develop a custom solution, within the shortest time, thanks to our modular platform concept.

Efficient cooling.

The higher the packing density of your electronic applications the more you will need a sophisticated cooling system to remove heat efficiently from cabinets and cases. Our modular air filtered fans, fan trays, air/air and air/water heat exchangers, compressor-driven air conditioners through to conductive cooling. This will equip you to meet the highest quality and environmental requirements on board rail vehicles in all situations.

europacPRO. Resistance to impact.

Our europacPRO subracks combine multiple benefits. Designed using materials providing strength and appropriate fixing elements, they are impact resistant while also satisfying the latest standards in regard to dimensions and environmental requirements. Tested to EN 50155 with typical loads, they offer the best conditions for secure and reliable system for on board rail vehicles.

VARISTAR. Vibration and shock resistant.

With VARISTAR you are playing safe. The robust Heavy-Duty frame with its high degree of rigidity meets IEC 61587-1 classes DL5 and DL6 under dynamic loads and can carry equipment weighing up to 800 kg. For yet more critical situations, optional shock absorbers provide further protection. Even earthquake resistance has been verified in dynamic tests to Zone 4.

Embedded Systems. Robust and secure.

Irrespective of the bus technology employed, our systems are based on robust subracks, high spec. power supply units and backplanes with various bus structures. We offer cost effective solutions and a comprehensive product range with almost unlimited options. They maintain the safety of the overall system under the most demanding situations. The components employed also meet enhanced system requirements, in particular the requirements for shock and vibration resistance, immunity to electromagnetic interference and effective cooling.



Electronic Packaging from Schroff – fit for mobility!

Efficient cooling with maximum performance

nments

... and the right cooling concept



Control systems on the Transrapid Service.

Modular 19" subracks used to house control electronics in cabinets or in underfloor areas.



Automatic train control system.

On-board computer system, housed in CONCEPTLINE case (IP 66) with europacPRO subracks and individual front panels.



Mobile communication systems.

CONCEPTLINE case with heat exchanger (IP 54), subracks and backplane for the digital GSM-R communications network.

Railway maintenance.

VARISTAR Heavy-Duty cabinets with shock absorbers for special rail vehicles, e.g. for track measurements. The selection and dimensioning of shock absorbers is performed by our specialist partner company SOCITEC.



THE ADVANTAGES AT A GLANCE:

- **Robust:** Proven mechanics for mobile applications
- **Secure:** Shock and vibration resistant to DL6 of IEC 61587-1, IEC 60068-2-6 and IEC 60068-2-28
- **Efficient:** Individual cooling concepts for demanding applications
- **Protected:** Lacquer finish to protect electronic components from corrosion, fungal attacks, etc. (conformal coating)
- **Complete:** Mechanical, electrical, electronic and thermal developments to customer requirements

Protection against vandalism

Protected from wind and rain

Innovative outdoor design ...



APPLICATIONS TRACKSIDE

Outdoor cabinets: dual security.

Be it in track and train control or in communications between the signal box and the train driver, electronics housed in outdoor cabinets are of vital importance for railway safety. Our outdoor cabinets therefore provide double security: protected on the outside from vandalism and on the inside with climate-control, this ensures that the electronics can withstand ambient temperatures between $-33\text{ }^{\circ}\text{C}$ and $+45\text{ }^{\circ}\text{C}$.

Climate control: low-noise and energy-efficiency.

Our double-walled outer shell and innovative "passive meander" system provide our outdoor cabinets with an effective natural cooling. This reduces both energy consumption and noise levels. Schroff brings "green technology" to stations, trackside and within tunnels. We see this as progress.

See page 16 for further information.

Design: simply everything taken into consideration.

Robustness.

Their high mechanical robustness means that even strong gusts of wind and the impact of stones thrown up by passing trains cannot harm a Schroff outdoor cabinet.

Fire safety.

Fire safety is also designed in: should the case occur, smoke detectors send an alarm to the control room, while any fire is extinguished by a fire-extinguishing system (mixed gases) in the cabinet itself.

Personnel safety.

The telescopic cover and the side panel can be extended to protect your maintenance personnel from rain.



Measurement systems along the tracks.

Robust, vibration-resistant "Modular" outdoor cabinet with air conditioner for safe positioning very close to the track, e.g. for detecting the wheel temperature of passing trains.

Voltage monitoring.

"Unibody" outdoor cabinet with low-energy, low-noise convection cooling for monitoring the cable voltage of overhead contact wires. Wall or mast mounting is also possible.

Infrastructure along the tracks.

Embedded systems consisting of matched components such as subracks, HF shielding, backplane, power supply and climate control, e.g. for axle counting or points heating.

Reduced noise levels

in

... for maximum security

APPLICATIONS IN OR AROUND STATIONS

System solutions from a single supplier.

While the robust, standardised construction of our outdoor cabinets assures problem-free maintenance, your computers, housed within, monitor and control train traffic and ensure safety. The better the components are matched to one another, the more perfectly the system will function.

One solution, one supplier. Our complete CompactPCI, VME and MicroTCA systems make it easy for you: backplanes, power supply units, battery control, mechanics and climate control - all components work dependably together. And thanks to conformal coating, environmental effects can have absolutely no effect on your electronics.

See page 22 for further information.

Platform monitoring.

"Unibody" outdoor cabinet with heating, internal ventilation, power supply unit and 19" internal assembly for video monitoring of platforms.



Passenger information systems at stations.

Climate-controlled outdoor cabinet with VME system to control indicator boards on the platform. Information terminal with integrated control unit to display and control passenger information.

THE ADVANTAGES AT A GLANCE:

- | | |
|-----------------------|--|
| ■ Secure: | Best protection against vandalism and temperature extremes |
| ■ Efficient: | Energy-efficient climate control |
| ■ Quiet: | Exceptionally low noise level |
| ■ Appropriate: | Modular product platforms that form the basis for individual solutions |



Modular platform for maximum flexibility

Everything securely under

Flexible and dependable ...

APPLICATIONS IN SIGNAL BOXES

Embedded systems.

Our electronics enclosure systems make monitoring and control tasks as simple as possible for you. From the mechanics, the backplane and power supply through to the thermal management design and individual expansion options, their modular design, comprehensive accessory programme and support of various bus technologies offer you everything a system requires. The benefits are clear: extremely high flexibility, absolute operational reliability and an optimal price-to-performance ratio.

Read more on page 22.

Electronic signal box.

Signal box computer with shielded 19" subracks and special backplane, designed for a wide temperature range of -20 °C to +70 °C.



Control in signal boxes.

Electronics cabinets, open or with glass doors, to accommodate systems and subracks in the signal box.



Guidance systems.

Guidance systems with modified standard cabinets and subracks, designed for a wide temperature range of -25 °C to +75 °C.

THE ADVANTAGES AT A GLANCE:

- **Powerful:** Multivariable cabinet platform for electronics systems, servers and network components
- **Large selection:** A wide range of PCI, VME/VME64x and MicroTCA systems
- **High flexibility:** Individual configurations thanks to modular platforms and custom developments from design to manufacture, all under one roof
- **Reliability:** Certified quality ensures security for railway services

Complete solution with high functionality

control



... and grown up to tackle complex tasks

DATA CENTRE APPLICATIONS

Reliability down to the smallest detail.

In rail systems safety is everything. Both at the control point and in the data centre, thanks to modern control and communication systems it can be continually further refined. Our components, complete systems and cabinet solutions, including the monitoring system, prepare you for any eventuality. Their certified quality, together with our decades of experience and competence at the interface between mechanics, electronics and climate control, assure you reliability down to the smallest detail. And this is the first prerequisite for solving complex safety tasks.

Intelligent and secure monitoring.

Be it the monitoring of operating parameters such as temperature and humidity, control of fans and heat exchangers, smoke detection, responding to a network failure or managing the locking system, our range of services can dependably solve even the most demanding monitoring task. Because all components are flexible enough to be adapted to individual requirements with ease.

Powerful: the VARISTAR network and server cabinet.

Whether it be loading capacity, energy efficiency, security or dynamic or climatic limit stresses, VARISTAR's outstanding characteristics answer to the trickiest conditions effortlessly. But that is not all. VARISTAR also helps you to reduce project costs, since it is both powerful and also economical. Its technical parameters are proof of this.

Read more on page 18.



VARISTAR: Stability due to the frame, cooling of up to 40 kW per cabinet for all housed components and static loading up to 800 kg.



Professional project management

Where performance meets de

Analysis, development, implementation, operation ...



Competence for individual solutions.

We have more than 40 years of experience in developing, manufacturing and integrating mechanical, electronic and thermal components. And this know-how is in each of our solutions, from the computer simulation through the specification and design of prototypes to series production.

You thus profit from technically mature, individually-tailored and economic enclosure solutions for railways that can be used anywhere in the world, all from a single supplier. Why can we do this? Because we have made the needs and future of our customers our highest priority.



Consultancy from the outset.

A team of experts is available to you from the start and accompanies your project through the entire development cycle.

Shock, vibration and heat simulations.

Mechanical simulations based on the finite-element method and thermal simulations using Flowtherm software verify our products even before the prototype phase. Selection and design of shock absorbers is carried out by our renowned specialist partner.

3D CAD design.

Modern 3D CAD-based design shortens development times and thus reduces development costs through to design approval. Prior to building a prototype, we always perform a 3D CAD data exchange with our customers.

Prototypes and pre-production runs.

Here the function and loading capacity of individual developments are tested in the shortest time under realistic conditions.

Testing and inspection systems.

An extensive range of testing and inspection systems for thermal, electronic, mechanical and shielding testing on our premises form an integral part of the development process and aid permanent quality assurance.

www.schroff.co.uk/railway

Project management at Schroff – simply in good hands.

Focussed entirely on customer requirements

pendability

... at your side from A to Z



Modern manufacturing facility.

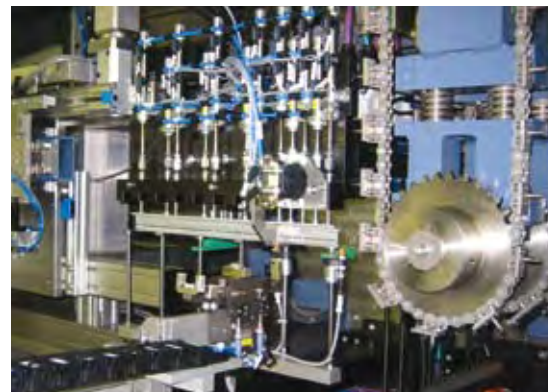
Innovative production methods and modern machinery allow optimal use of resources. With manufacturing locations in Europe, the Americas and Asia we are able to manufacture close to our customers.

System integration.

We integrate mechanical, electrical, electronic as well as non-proprietary components in a cabinet or case. You receive a plug-and-play product from a single source.

Certification.

We ensure the certification of customised products to your individual requirements.



Ready for operation - with certainty.

If you wish, we will professionally install your indoor and outdoor cabinets on-site. Detailed quality assurance documentation is provided at final acceptance. And your product is ready for operation in the shortest possible time.

Regular maintenance.

On the basis of an agreed maintenance contract our experts will check and inspect your systems and equipment. Simply agree a fixed response time. And with GuaranteePLUS you can even extend the warranty period.



THE ADVANTAGES AT A GLANCE:

- **Guaranteed reliability:** Exceptional products made to the highest quality
- **The best advice:** One contact partner throughout the entire development period
- **Goals quickly achieved:** Short project times, everything from a single supplier and highprecision logistics
- **Optimal customer priority:** Clearly-structured service options through ServicePLUS

An active member in international standards committees

Where experts design the

Know-how and research competence ...



Certified quality and competence.

As applications grow more complex, the dependability of partners and long-term confidence in the technology become ever more important. For some 30 years we have participated actively in the standards committees of international organisations such as IEC, IEEE, VITA and PICMG. Thus we remain abreast of worldwide standards and you can be sure to profit from the latest technologies. Plus Schroff is certified to ISO 9001, ISO 14001 and OHSAS 18001 and has been for many years.



Mobile - and secure.

In railway systems the highest security has absolute priority. A failure in sensitive equipment can have catastrophic consequences. Our products thus fulfil the demanding railway standards concerning mechanical stability, shock, vibration and EMC, whether they are standard components or custom developments. The trust and satisfaction of our customers are the proof of this.

IRIS certification.

Building on DIN ISO 9001, our Straubenhardt and Betschdorf sites will be certified to the International Railway Industry Standard (IRIS) by 2010.



Standard	International	German Railways	French Railways
	IEC 60297-3-100 ... 105		
	IEEE 1101.1		
	IEEE 1101.10		
	IEEE 1101.11		
Dimensions		BN 411003	NF F 61-005
	IEC 61587-T2		
	EN 50155		NF F 67-012
Shock and vibration	MicroTCA.1 (Rugged MicroTCA)	BN 411002	NF F 60-002
	VG 95373 P15		
EMC	IEC 61587-T3		
IP protection	EN 60529		

VARISTAR - Shock and vibration:

Results of testing to IEC 61587-1: 2000-01

Installed load: 150 kg

Shock: maximum acceleration 5 g, duration 11 ms

Vibration: from 5 to 100 Hz

Acceleration: DL5: 5 m/s (0.5 g); DL6: 10 m/s (1 g)

DL5: Shock and vibration loads as occur in railway and road signalling equipment.

DL6: Stresses such as occur on merchant ships and in low-demand military installations.

VARISTAR - Seismic:

Results of testing to IEC 61587-2: 2000-01

Installed load: 250 kg

Acceleration: Bellcore Zone 3: 3 g, 1 Hz-5 Hz

Bellcore Zone 4: 5 g, 2 Hz-5 Hz

Subracks - Vibration test (noise waveform):

Results of testing to EN 50155

Test duration: 5 h per spatial axis, in 3 spatial axes

Amplitude:

Longitudinal/transverse axis

Vertical axis

5 Hz, 0.00901 g²/Hz 5 Hz, 0.01857 g²/Hz

20 Hz, 0.00901 g²/Hz 20 Hz, 0.01857 g²/Hz

150 Hz, 0.0001603 g²/Hz 150 Hz, 0.0003301 g²/Hz

Subracks – Shock testing (half-sinusoidal waveform):

Results of testing to EN 50155

Amplitude: 5 g

Shock duration: 30 ms

Number of shocks: 3 shocks in both axis directions of the three orthogonal main axes of the test object. Test was conducted as per Class B of the standard.

Market-leading product range

future

... assuring your success

Shock and vibration test.

Schroff products assure impact resistance in mobile applications. These products are tested equipped with typical loads, either in-house or in the laboratories of certified institutions.

HF shielding test.

HF shielding is designed into the basic structures of our products. Testing takes place in our own laboratory or at the High Frequency Institute of the University of Karlsruhe.

Flowtherm simulations.

Simulations of temperature distribution and airflow patterns assist in designing the cooling concept and in locating hot spots.

Climate bay testing.

Products can be tested under extreme environmental conditions in our in-house climate bays.

Wind-tunnel testing.

Airflow volumes and resistance characteristics can be determined in the wind tunnel, allowing us to set up the air cooling for optimal efficiency.

Salt spray testing.

Here corrosion resistance and surface ageing of the test object are tested in a vaporised salt solution.

Noise measurement.

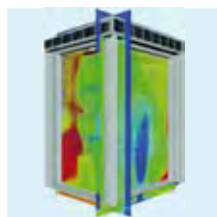
The noise level generated by the object is measured using the latest technology to ensure conformity to the relevant standard.



Shock and vibration test



HF shielding test



Flowtherm simulations



Climate bay testing



Wind-tunnel testing



Salt spray testing



Noise measurement

THE ADVANTAGES AT A GLANCE:

- **Conformity to standards:** Tested to all relevant standards
- **Superb stability:** High physical robustness up to earthquake zone 4
- **Perfect climate control:** Variable cooling concepts up to 40 kW
- **Tailored HF shielding:** Outstanding shielding to suit your requirements
- **Modern:** The most up-to-date measuring and testing systems in our inhouse laboratory



Robust and highly functional

Outdoor cabinets

Vibration resistant and vandalism proof ...



Versatile.

Whether it be for track control, train monitoring or platform control, you can use our outdoor cabinets in a variety of settings.

Certified quality.

Schroff outdoor cabinets ensure the smooth and dependable functioning of sensitive electronics in outdoor environments. Their standardised components are based on IEC 61969. They not only fulfil the guidelines and standards for shock, vibration and earthquake resistance but also offer climate protection tested to IEC 68-2-1.

Impressive all around.

Further technical advantages are the weight-saving, corrosion-resistant and robust aluminium construction, the ease of access and special cable entry provision. Newly designed cladding parts, hinges and locks provide enhanced protection from vandalism. And the expansion options are flexible, accepting 19", ETSI or other, even non-standardised, accessories.

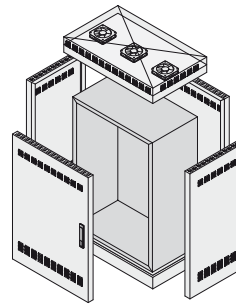
Two types, one system.

Unibody: simple and cost-optimised.

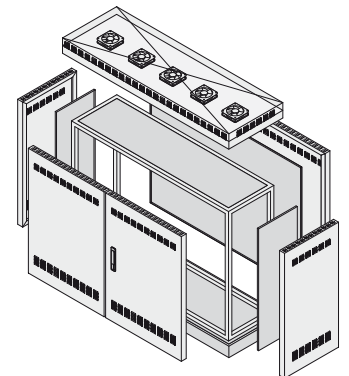
Whether wall, pole or ground mounted, the unibody design scores with its cost-optimised inner enclosure and removable outer cladding. Its advantages rest particularly in smaller cabinets, where access via the front door is sufficient for installation requirements.

Modular: flexible and optimised for maintenance.

The modular version consists of an aluminium profile frame with removable double-wall cladding. Its high flexibility offers significant advantages for larger cabinets and for the case where access is required from all sides.



Outdoor cabinet Unibody



Outdoor cabinet Modular

THE ADVANTAGES AT A GLANCE:

- **Superb climate control:** Energy-saving, low-maintenance and low-noise climate regulation
- **Perfect solutions:** Two designs - Unibody and Modular
- **Windproof and weather resistant:** Weight-saving, corrosion-resistant and highly robust aluminium construction
- **Securely protected:** Vandalism-proof, with anti-graffiti coating on request, protection class IP 55

Further information: www.schroff.co.uk/outdoor

Climate-control competence from Schroff – unbeatable innovation.

Innovative climate-control systems

... "Green Technology" for rail traffic

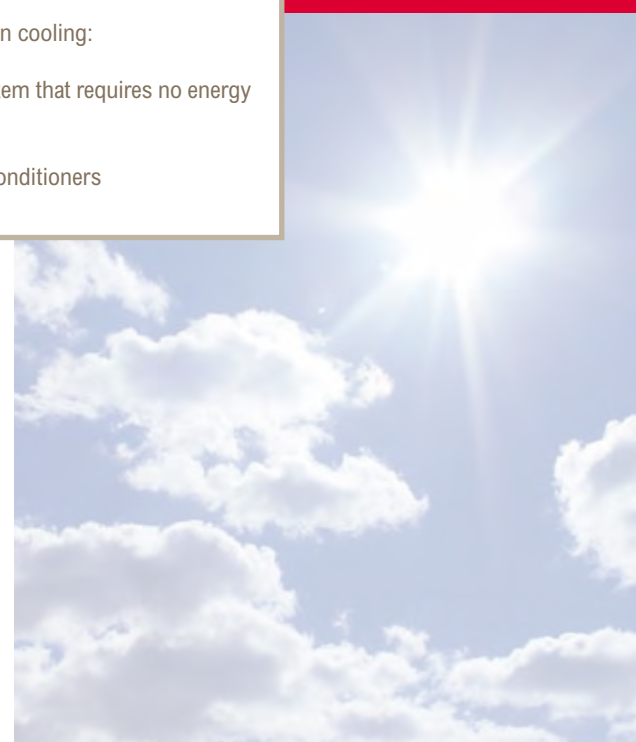
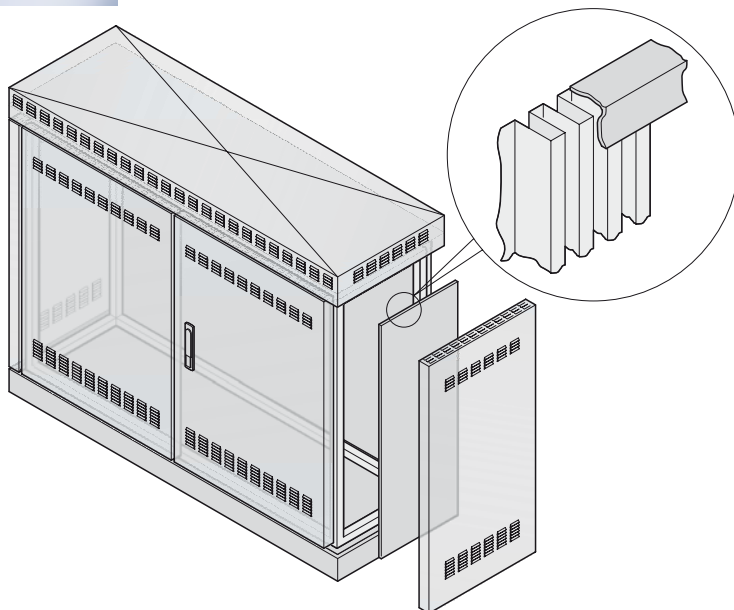
New approaches to heat removal.

With our outdoor cabinets we are treading wholly new paths in cooling:

- Passive ventilation in the double wall
- Energy-efficient heat extraction with the passive meander system that requires no energy input and creates no noise
- Fans for the space between the double walls
- Fresh air cooling via air-filtered fans, heat exchangers or air conditioners

Naturally ingenious: the double-wall design.

Use of a double wall sharply reduces heating within the cabinet from solar radiation. At the same time, it helps to remove the heat inside the double wall with a natural flow of air. The benefit: your outlay for additional cooling is substantially less. The double wall offers similar benefits in protecting from the cold.



Technically brilliant: the passive meander system.

Our new outdoor cabinets are a further demonstration of Schroff's force for innovation: in this passive system the inner walls are constructed in a 'meander' form. Thus the resulting increased surface area acts as a heat exchanger, transferring more heat from the interior to the gap between the walls. Up to 600 - 800 watts at a temperature difference of 25 K.

"Green Technology" for railways.

Often enough, the passive meander system achieves sufficient cooling on its own, requiring no energy input and creating no noise. Providing total reliability and zero maintenance. This is indeed a sound implementation of "green technology" for outdoor applications.



Extremely stress-resistant, unbelievably powerful

Indoor cabinets

VARISTAR: Master of every discipline ...



Just the job for extreme environmental conditions.

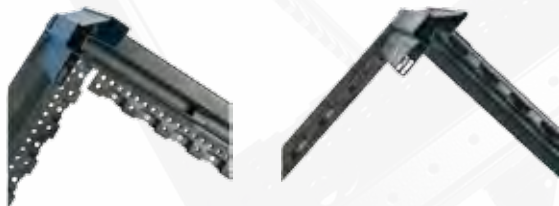
The VARISTAR electronics cabinet must operate in accordance with the requirements of all situations. It has therefore been designed such that you can depend on it one-hundred percent even under extreme environmental conditions. After all, it is reliability, down to the last detail, that makes complex safety tasks achievable - and also economic.

Slim-Line.

The special Slim-Line extruded profile is capable of a static load-carrying capacity of 400 kg with a minimum of materials, and satisfies the DL5 and DL6 requirement classes of IEC 61587-1 for dynamic loads.

Heavy-Duty.

The robust Heavy-Duty frame was specially designed for high load-carrying applications. Thanks to its higher bending stiffness it can accept a static load of 800 kg, while under dynamic loads it satisfies classes DL5 and DL6 of IEC 61587-1. Dynamic tests also demonstrate earthquake resistance up to zone 4.



Vibration and shock resistant.

These characteristics are of particular importance for mobile applications on board rail vehicles. Both VARISTAR profiles, Slim-Line and Heavy-Duty, protect their electronic systems with their high mechanical stability and dynamic load-carrying capacity exactly as your application requires, thus making an important contribution to the safe and problem-free functioning of the overall system.

Shock absorbers.

For still higher resistance to shock and vibration, VARISTAR solutions can be further equipped with SOCITEC shock absorbers.

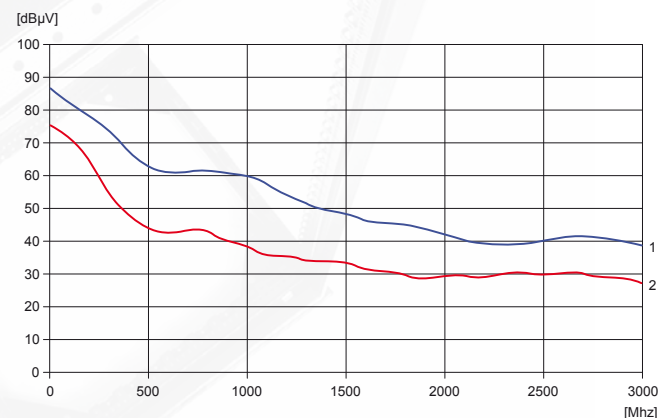
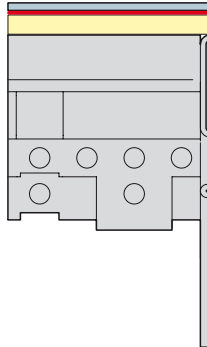


Long-term service.

VARISTAR remains unfazed even by unfavourable conditions such as humidity and dirt. Zinc-plating and additional powder-coating provide a double protection against corrosion.

HF shielding and IP protection.

The VARISTAR shielding principle protects sensitive data from interference radiation. Tested to IEC 61587-3. The HF gasket simultaneously forms a barrier against dust and water to IP 55.



1 Cabinet with solid steel door
2 Cabinet with perforated door

As varied as your requirements

... efficient in all dimensions

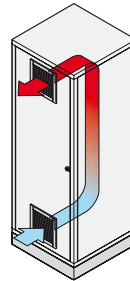
Variable cabinet cooling up to 40 kW.

Scaleable, modular and energy-efficient: with our cooling solutions you are playing safe. Our VARISTAR LHX programme, for example - our complete solution with integrated heat exchanger - excels with its high energy efficiency and high cooling capacity. This means that the cabinet can be cooled using the smallest possible floor area and with minimal energy use. And with a lower noise level. VARISTAR LHX also gives you up to 20 % more space in comparison to other cabinet solutions.

Modular and efficient.

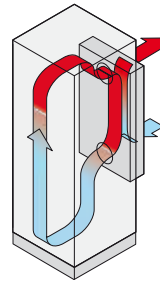
Depending on the amount of heat generated and the internal and external temperatures, various cooling concepts may be applied to keep electronics cabinets effectively cooled. These may use air-filtered fans, fan trays or controlled airflow systems through to air/air or air/water heat exchangers and compressor-driven air conditioners.

Air filtered fans



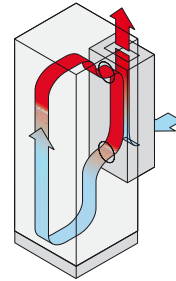
Description Forced cooling with air

Air/air heat exchanger



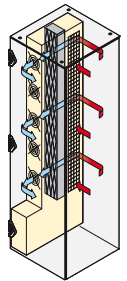
Description Forced cooling with air

Air conditioners



Description Cooling with coolant

Air/water heat exchanger (LHX 40)



Description Cooling with water

Description	Forced cooling with air	Forced cooling with air	Cooling with coolant	Cooling with water
Type of protection	≤ IP 54	≤ IP 54	≤ IP 54	≤ IP 55
Noise level approx.	39 ... 71 dB (A)	55 ... 75 dB (A)	50 ... 81 dB (A)	50 ... 60 dB (A)
Ambient conditions	$T_i > T_a$	$T_i > T_a$	$T_a \leq 55^\circ\text{C}$	$T_a \leq 70^\circ\text{C}$
Cooling capacity approx. ¹⁾	< 1500 W	< 2000 W	< 2600 W	< 40000 W



THE ADVANTAGES AT A GLANCE:

- **Robust:** Proven mechanical design for mobile applications
- **Secure:** Shock and vibration resistant to DL6 of IEC 61587-1 and IEC 60068-2-6
- **Extra secure:** Additional protection with optional shock absorbers
- **Shielded:** Exceptional shielding characteristics as standard: 60 dB at 1 GHz, 40 dB at 3 GHz
- **Ideal cooling:** Heat removal to your exact requirements with a variety of cooling concepts; water cooling of up to 40 kW
- **Well protected:** Protection class up to IP 55
- **Flexible:** Modified and fully assembled VARISTAR cabinets at www.schroff.co.uk/ServicePlus

For further information see www.varistar.co.uk

Technical and economic advantages that stand out

Subracks

Rail certified and immensely variable



europacPRO subracks.

The europacPRO 19" subrack system with its modular construction offers you many profitable advantages, both technical and economic. Its standard components allow versatile combinations, letting you implement a range of versions in varying height, width and depth, simply, cost-effectively and with no design outlay.

Shock and vibration resistant.

The europacPRO system meets the strict requirements for rail applications and protects the electronics within with its robust construction. Use of suitable material strengths and fixing elements, together with TOX-cold welded side panels, ensure resistance to shock and vibration even in the most demanding situations on rail vehicles.

Well shielded.

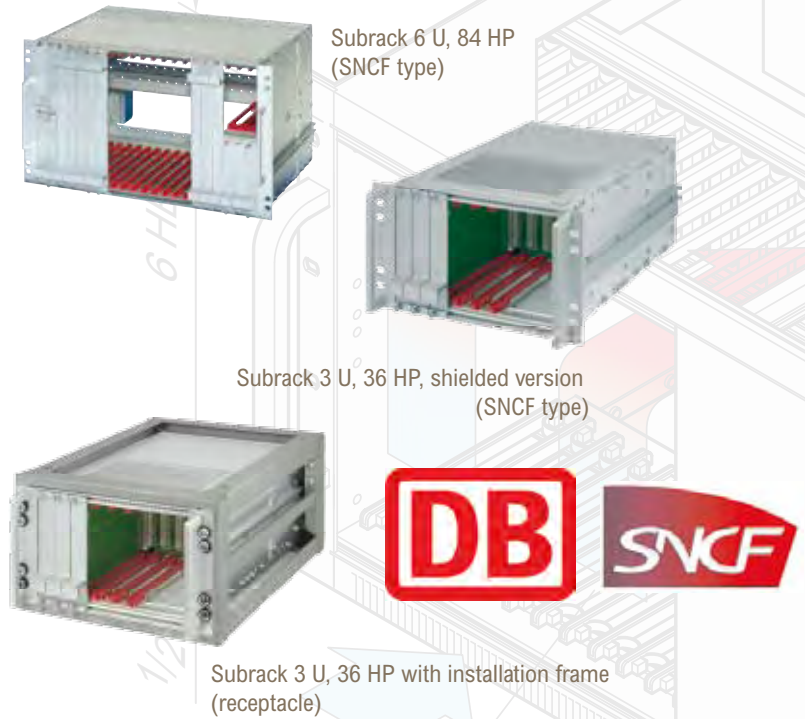
Contact-spring or conductive textile gaskets in the front panels of plug-in units also provide secure HF shielding.

All-round tested and rail certified.

Safety is guaranteed with testing and certification to many current standards. You can download all the tests from www.schroff.co.uk/testreports.

Optimal cooling.

Our systems are designed to ensure optimal cooling of the electronics together with maximum shielding and IP protection, irrespective of where they are installed.



THE ADVANTAGES AT A GLANCE:

- **Variable:** Flexible dimensions from 3 U to 12 U and 21 HP to 84 HP in standard range
- **Meets the standards:** The subrack programme conforms to IEC 60297-3-100 to IEC 60297-3-105, IEEE 1101.1, 1101.10 and 1101.11
- **Secure:** Tested to BN 411002, NF F 67-012, NF F 60-002, EN 50155 and IEC 61587-2
- **Shielded:** EMC tested to IEC 61587-3, VG 95373 T.15
- **Assembled:** For modified and completely assembled subracks go to www.schroff.co.uk/ServicePlus

For further information see www.schroff.co.uk/subracks

As flexible to configure as your application

Front panels and handles

Various finishes and wide range of handles

Various finishes.

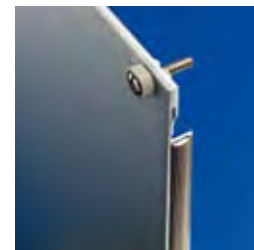
Shielded or unshielded, flat or U-profile - you can stay flexible right down to the front panel. Aluminium anodised, pre-anodised, plain or iridescent green chromated – you decide on the best finish for your application, to suit both function and look.

A wide range of handles.

Static handles, special handles for embedded systems or heavy-duty insertion and extraction handles for applications with very high insertion and withdrawal forces - our range of handles ensures that functionality does not have to be without convenience.



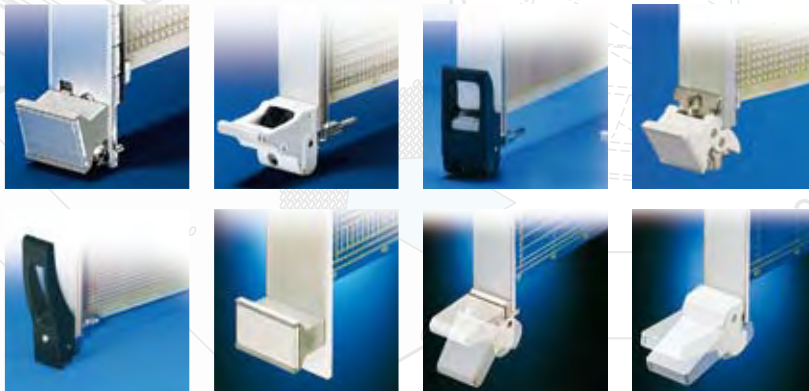
Front panels with handle



Shielded front panels, U-profile



Unshielded front panels



FRONT PANEL EXPRESS.

Cut-outs for connectors, LEDs, handles, switches, and screen printing – the front panel strongly determines the appearance of a case or subrack. With Front Panel Express you can give your front panels an individual configuration. Fast delivery from two days. More information at www.frontpanelexpress.eu

THE ADVANTAGES AT A GLANCE:

- **Large selection:** A comprehensive programme with various finishes; even non-RoHS compliant if required
- **High functionality:** Handles for the most diverse applications
- **Fast delivery:** Fast delivery service of customised items, including drawings download
- **Flexible:** HF shielding can be retrofitted

For further information see www.schroff.co.uk/frontpanels



Wide selection of leading system solutions

Embedded Systems

All components from a single source ...



Complete systems.

Our standard systems already cover many applications in railway technology. We can adapt them quickly to your specific product requirements at any time. So either way, you have a complete solution from a single source.

Shock and vibration resistant. With optimal cooling.

All systems meet the highest requirements for shock and vibration resistance, and therefore meet the especially high demands for railway applications. Likewise, they shine with their cooling systems that are as efficient as they are intelligent. Our systems are designed to ensure optimal cooling of the electronics together with maximum shielding and IP protection, irrespective of the situation in which they are installed.

MicroTCA:

The new standard for fast computer systems.

Micro Telecom Computing Architecture achieves the highest data-transfer rates with maximum system availability. The MicroTCA.1 (Rugged MicroTCA) standard now in preparation will also satisfy the requirements of railways, including shock and vibration and extended temperature ranges. Because we play a major role in the development of new standards, we already offer a broad spectrum of MicroTCA products and accessories such as front panels, filler panels, management solutions and backplanes. We can now already supply subracks and front panels for Rugged MicroTCA.

For further information see www.schroff.co.uk/microtca



MicroTCA



CompactPCI



VME

CompactPCI: Systems out of the box.

Our CompactPCI systems conform to the latest version of the standard. Based on the robust 19" europacPRO subrack, they satisfy all requirements for shock and vibration resistance. Simple to complete with versatile standard components such as backplanes, power supply units or fans from our kit system, Schroff CompactPCI systems offer not only an extreme degree of flexibility but also an optimal price-to-performance ratio. In addition, customisation or modification to specific requirements can be easily effected.

For further information see www.schroff.co.uk/cpci

VME64x and VME: flexibility with variable modules.

Our plug-in VMEbus systems meet the latest standards. Their physical construction is based on the renowned 19" europacPRO subrack. In addition to a range of standard configurations, these systems can be equipped with backplanes, power-supply units, fans, drives or other components as required. The microcontroller-based monitoring system ensures high functional security for the fans and reduces the noise level. Thus even custom modifications can be implemented without problems.

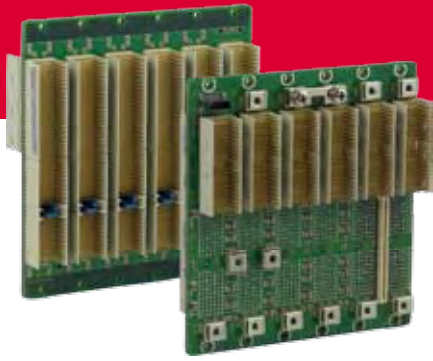
For further information see www.schroff.co.uk/vme



Powerful and future-proof

Backplanes and power supply units

... all competencies under a single roof



Backplanes.

The performance of the backplane is decisive for the overall performance of the system. Our backplanes are ideal for use in railway systems: the exclusive use of SMD components makes them very resistant to shock and vibration. A further benefit: for decoupling the supply voltage we employ only ceramic capacitors with selected electrical values, thus the power supply system remains stable and low in impedance up to the highest frequencies. That way both the emission and the initiation of power-related faults are reliably prevented.

For further information see www.schroff.co.uk/backplanes

Power supply units.

Schroff also offers you the best components in the area of power supplies. Our power supply units have a wide-range input of 16 to 154 VDC and cover all voltage ranges for the European railway network. They are also extremely reliable, even through a temperature range of -40 °C to +85 °C.

For further information see www.schroff.co.uk/powersupplies

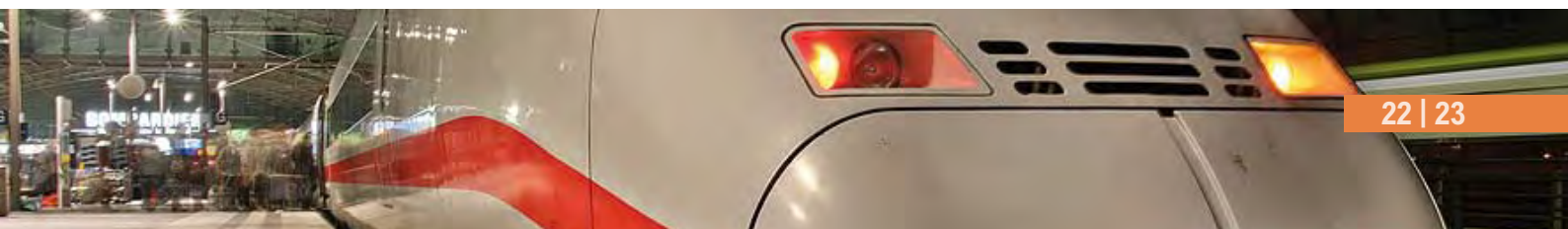
Conformal coating.

To protect them from humidity, fungal infestation and condensation, we can cover our backplanes and power supply units with a special lacquer - the conformal coating. This special surface protection is added in our purpose-built in-house facility, in a laminar box with a water curtain to ensure dust-free conditions.



THE ADVANTAGES AT A GLANCE:

- **Robust:** Backplanes and power supplies protected by special conformal lacquer coating
- **Conforming to the standards:** Conformity to railway standards, including EIRENE (European Integrated Railway Radio Enhanced Network) for GSM-R, the first pan-European railway standard
- **From a single source:** Short development times and all required competencies under one roof
- **Large selection:** Standard range from stock; customising for backplanes, power supply units and systems on request



Unbelievably versatile

19" chassis

multipacPRO: the best solution for many applications



Ingeniously solved.

To optimise the accommodation of non-standard components we have developed a robust and versatile complete 19" chassis, the multipacPRO (1U to 5U). Where otherwise tricky space or mounting issues would arise, you can now fit your non-standard components, electrical components and power supply units with ease. The well-designed expansion kits naturally also accept standard board formats.

Astonishingly versatile.

Thanks to its simple yet brilliant construction, together with a variety of expansion options, optional HF shielding and even mounting on telescopic rails, multipacPRO scores in many applications:

- Electrical control systems in signalling or for display boards
- Passenger information displays or video applications in the data centre
- Installation of routers and switches
- Video surveillance of platforms and subways



THE ADVANTAGES AT A GLANCE:

- Form plus function: Highly robust, based on a simple design principle
- Rich in ideas: Universal and highly adaptable for all areas of electronics
- Strong performance: A cost-effective alternative to a subrack or system
- Always compatible: Based on the IEC 60297-3-105 19" standard
- Everything thought out: High shielding in all frequency ranges

For further information see www.schroff.co.uk/multipacPRO

Casing technology from Schroff – simply a clever idea.

Astonishingly adaptable

Wall mounted enclosures

Winners in the tightest space

The right one for every place.

There is often not much space on rail vehicles. Our wall-mounted enclosures offer a tailored solution for any requirement in the smallest space. They provide a basis for rail applications to be specified individually and tested to EN 50155.

Indoor cases in steel.

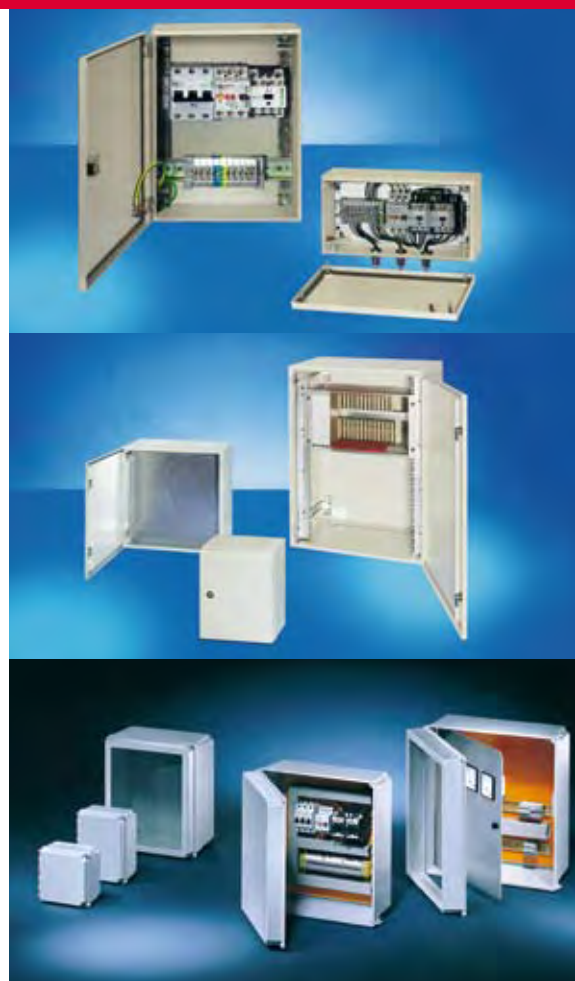
CONCEPTLINE cases with standard dimensions up to 1200 mm height allow exact matching of the exterior dimensions to the specific installation position. The 600 mm wide version can be fitted with 19" panel/slide mounts and thus accept all 19" components, from sub racks to complete systems. The INLINE product range includes terminal and installation cases with heights up to 400 mm. You also retain flexibility on the fixing system, be it DIN rail mounting or mounting-plate applications.

Indoor and outdoor applications: Plastic cases.

The A48 case in fibreglass reinforced polyester is particularly suited to highly-corrosive environments (caused by oil, lubricants or salt compounds). Further small cases in polycarbonate with transparent or solid cover complete our range of plastic cases.

Outdoor cases in aluminium.

The COMLINE series of cases is an ideal solution for outdoor applications. These aluminium cases score with their particularly high corrosion resistance. Here again you can choose between several standard sizes, each with or without a rain cover.



THE ADVANTAGES AT A GLANCE:

- **Securely protected:** Up to IP class 66
- **Flexible expansion options:** Depth-adjustable 19" installation plane or via mounting plates
- **Well-thought-out construction:** Gland plate for cable entry
- **Can be used worldwide:** Certified by UL and CSA

For further information see www.schroff.co.uk/wallmountedcases



Precision cooled

Climate-control

Cooling components for well-tempered electronics



Good advice all round.

Whether it is complete cabinet systems or a single application, our experienced climate experts draw on their comprehensive know-how and the most modern technology to help you find the optimal climate-control concept. We ensure by means of simulations, for example, that the cooling capacity required is exactly matched to your planned equipment and its envisaged performance. And we have exactly the right components for every need.

19" fan trays: targeted heat removal.

Where electronic components within systems or cabinets require cooling, fan trays provide a controlled removal of heat. Our fan trays offer several advantages: they impress with their long service life and minimum-noise operation, can optionally be fitted with function monitoring systems, feature mechanical protection against accidentally touching the blades and, thanks to their well-thought-out design, can even be adapted for direct use with subracks. For specific applications we also develop individual fan trays precisely to custom specifications.

For further information see www.schroff.co.uk/fanunits

Air filtered fans: cooling with protection.

Air-filtered fans represent a highly cost-effective and efficient method of climate control in cabinets. They ensure optimal air circulation and may be switched between suction and blowing operation, as required, quickly and simply. A further benefit is their ease of installation: simply clip them in, and they begin fulfilling their function at once, securely and reliably. This saves time and costs. And the IP 54 protection class remains unaffected. But that is not all. Thanks to their extremely flat construction they require a minimum of internal space. If required we can also provide air-filtered fans with HF shielding.

For further information see www.schroff.co.uk/airfilteredfans



Heat exchangers and air conditioners: effectively cooled.

In closed electronics cabinets, heat can be very efficiently extracted via heat exchangers (air/air or air/water). Compact and flat construction, a low noise level and above all high efficiency make these devices the first choice - for even the most diverse of requirements and custom projects. Where no water supply is available and the inner cabinet temperature must be kept below the ambient temperature, the use of compressor-based air conditioners is essential. These devices remove heat by means of a coolant. Our side-mounted air conditioners, covering a range from 400 W to 2600 W, impress both with their compact and flat design and their high efficiency. Integrated condensate water evaporation and temperature control via thermostat or microcontroller make their use even more efficient.

For further information see www.schroff.co.uk/airconditioners



Together we are strong

Future needs a reliable partner



**Your partner
for rail traffic systems**

www.schroff.co.uk/railway



Established as one of the best

Worldwide market competence. Local to you.



As a partner for the global electronics industry we are established as one of the best.

As an international company, Schroff takes advantage of the opportunities offered by globalisation. Manufacturing and development locations in Europe, America and Asia make worldwide market competence possible in the first place. Decentralised marketing and distribution networks with over 50 representations worldwide guarantee both closeness to our customers and optimal satisfaction of local market demands.

Up-to-date, detailed contact information for all our branches and representations can be found on our web site:

www.schroff.biz

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